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THE CHEMISTRY OF PLANTS.

Biochemie der Pflanzen. Zweiter Band. By Prof. Dr. Fr. Czapek. Pp. xii+1026. (Jena: Gustav Fischer, 1905.) Price 25 marks.

THE first volume of this work was reviewed some months back (*NATURE*, June 22, 1905, vol. lxxii. p. 169), when its general scope and nature were given, and certain remarks were made with respect to its style and structure which are equally applicable in the case of the second volume; hence no recapitulation of these is here necessary.

The material of the present volume is roughly double that of the first, and its magnitude is gauged by the number of the pages given above.

As the first volume dealt with the distribution, metabolism, and metastasis of aliphatic substances, so the second deals with proteinic compounds and the biochemistry of nitrogen, with derivatives of closed rings, and with the inorganic constituents of plants; further, the resorption of oxygen, and phenomena of irritability regarded in their biochemical aspect, also receive detailed attention.

The contents of the volume are divided into thirty-eight chapters, which are followed by addenda and corrections, an index of the subject-matter, another of the names of plants, and finally a list of misprints and errata.

The book opens with a chapter on the general chemistry of proteins. The succeeding chapters are grouped, more or less, into sections under the following headings:—the proteinic metabolism of the Fungi and Schizomycetes, that of seeds and of other organs and groups of plants, the ultimate nitrogenous and anitrogenous products of metabolism, the resorption of oxygen, pigments, ubiquitous cyclic and acyclic compounds, the metabolism of inorganic substances, and lastly the stimulatory action of various bodies.

The opening chapter gives a suitably condensed and, as regards the main outlines, comprehensive account of the chemical and physical properties of proteins and the products of their decomposition. In the succeeding two sections the nature of the proteins occurring in different plants and different organs is discussed, and an account is given of the modes in which these compounds are synthesised and rendered available for metabolic processes when external to the plants. The absorption of soluble nitrogenous compounds is also considered in these sections, which are, in fact, concerned with the general metabolism of nitrogenous substances throughout the vegetal kingdom.

In the next section the ultimate nitrogenous products of metabolism are discussed in detail under the following headings:—oils, purine-bases, nitril-glucosides, bases derived from pyridine and chinoline, and derivatives of indol.

The section devoted to resorption of oxygen deals biochemically with ordinary respiration and the acquisition of chemically-bound oxygen.

Following the sections devoted to pigments,

substances of universal occurrence, and the ultimate anitrogenous products of metabolism, is an exhaustive treatment of the metabolism of inorganic constituents in various divisions and organs of plants, and of the modes of their occurrence.

The text concludes with an interesting and well-written account of the stimulatory action of various substances in relation to different vital processes such as fermentation, respiration, photosynthesis, protoplasmic streaming, nuclear division, growth, reproduction, &c.

An idea of the degree of comprehensiveness and detail of the work is afforded by the titles of some of the minor chapters, namely, the proteinic metabolism of pollen-grains, that of fruits, of mosses, of algæ; the inorganic metabolism of subterranean reserve-organs, the inorganic constituents of buds, those of wood, of bark, of algæ, of pollen-grains, of fruits.

The main outline of this volume may be said to have been given in the preceding paragraphs.

What appears most striking here, as in the first part, is the colossal amount of material collected; the labour involved must have been enormous. A result of this is the resemblance of the text of many pages to some highly-condensed abstract, as it is in such places practically a long succession of facts—or reputed facts.

Like the first volume the second is singularly free from misprints and errors of nomenclature. But one scarcely expects to read in a precise botanical work—as on p. 818—of the “stem” and “leaf” of *Laminaria*, a plant that has neither stem nor leaf. Moreover, in no case has Prof. Czapek attached to the name of a plant that of its author; this omission is certainly a common one in botanical works, but in spite of this most deplorable, since in many cases in which this index fails the nature of the plant is doubtful.

Many useful tables of figures occur throughout the work, and orientation with respect to groups of chemically-allied substances is much facilitated through the interpolation of numerous graphic formulæ in the text.

The literature dealing with the subjects treated seems to have been searched with considerable thoroughness, and that which is most essential referred to in relatively suitable proportion. Possibly those who have made the various branches touched upon their special study might detect important omissions, but so far as lay in the power of one man Prof. Czapek seems to have been very successful in citing all that is most important. The reviewer misses reference to Schjerning's important paper on proteohydrolysis that appeared about three years back in the publication of the Carlsberg laboratories, and he sees no mention in this volume of the work by F. F. Blackman on gaseous exchanges, or of that by Cornevin on the degree of immunity of plants to vegetal poisons of autochthonous and alien origin.

Prof. Czapek is not of the opinion that the acceleration of oxidative processes by various metallic salts in association with colloids is likely to result in modification of existing notions of oxydases. The matter

is one, however, that requires extended quantitative and qualitative treatment. The supposition that an action is *entirely* due to a colloid, because the action ceases on separation of the colloid from the system, is an error commonly made by physiologists, due to the omission of taking into account phenomena of adsorption, and the complete alteration of conditions produced by the change.

There can be no doubt as to the value of this work in its completed form; it traverses practically the whole of physiology in its chemical aspect, so far as it is now possible to do so, and illustrates in an excellent manner the results that have been produced through application of chemical methods to physiological problems; it is the first extended treatise of the biochemistry of plants, and as such fills a void that was distinctly appreciable, and moreover fills it in a manner that places all vegetal physiologists under great obligation to its author.

F. ESCOMBE.

EXPERIMENTS WITH EXPLOSIVES.

New Methods of Testing Explosives. By C. E. Bichel. Translated and edited by Axel Larsen. Pp. 62. (London: Chas. Griffin and Co., Ltd.) Price 6s. net.

IN collecting together and translating the papers on the researches carried out in the laboratory of the Carbonite Explosives Company, Hamburg, the translator has given to English readers a valuable and interesting little volume. The title is perhaps a trifle misleading, but the whole scope of the work may be seen from the following quotation:—“(1) Why does a smaller quantity of one explosive than another cause ignition of fire-damp? (2) What are the incidental phenomena and the influences tending to promote such result? (3) In what manner do they co-operate in producing it?”

Appreciating the fact that it is desirable to work with quantities as nearly as possible approaching those employed in actual practice, special apparatus has been constructed, so that for the particular explosives dealt with we now have details obtained from experiment on a much larger scale than any hitherto adopted. In some cases charges of gunpowder as great as 1500 grams were exploded, and for the higher explosives often 300 grams. Even for the calorimetric determinations the bomb had a capacity of 30 litres, which was capable of taking a charge of 100 grams. There must always, however, be some risk with heavy charges of recording undue pressures, a point to which Noble has directed attention.

The actual pressures, gas volumes and composition of the products were determined from charges fired in Bichel's apparatus, the pressure being recorded by a piston indicator working on a drum. The record is really in excess of the true pressure, but it is stated that the indicated pressure is rarely more than two or three per cent. from the actual. The apparatus permits of variations of surface area for a definite charge, and so the cooling effect of the chamber may be eliminated. It appears that with

this allowance the pressure at a given density of loading is proportional to that with higher densities. This, however, may not be strictly true with very high densities.

The actual temperature at the moment of explosion was calculated from the heat developed, the composition of the products and their specific heat, in the usual manner, but all such calculations are uncertain owing to doubt as to the specific heats of gases at these high temperatures, and the impossibility of taking into account dissociation. The possibility of fitting a thermo-junction into the Bichel apparatus might be worthy of consideration, for although the results cannot approach actual values, yet the relative temperatures recorded would probably serve as a useful check on those calculated. Macnab has already employed the thermo-junction for this purpose.

In connection with the safety of explosives for mining, undoubtedly the length of the flame, its duration and temperature are of the greatest importance. The two former were recorded photographically, a quartz lens being used. Some excellent plates of the flames are reproduced. A factor deduced from the ratio of the flame duration to the detonation time, termed the “after-flame ratio,” is shown to have the greatest influence on the ignition of fire-damp, and a most instructive diagram shows the temperature developed, the length of flame, and the “after-flame ratio” for the explosives examined.

In considering the efficiency of an explosive the author makes a distinction between the dynamic action, due to the projectile-like action of the products on the surrounding surfaces, and the static energy, deduced in the usual manner from the volume occupied by the products at the calculated temperature of explosion. It certainly seems that a more rational classification is thus possible than when the two are considered together, and the results are claimed to be fairly in accordance with those obtained in actual practice.

The general bearing of the work on the question of safety is clearly dealt with, and four very complete tables give a mass of information relating to the explosives examined.

Sufficient has been said of the contents of the book to convince those interested in the subject of its great value. It deals almost exclusively with mining explosives, but it would certainly be of very great interest if the investigations could be extended to military explosives, for the author has such valuable apparatus at his disposal that experiments on this large scale could not fail to give much valuable information.

J. S. S. B.

CAUSALITY AND THE HUMAN WILL.

The New Science of Causation. By H. Croft Hiller. Pp. xiii+386. (London: The Walter Scott Publishing Company, Ltd., 1905.) Price 10s. net.

IF intrepidity were the prime essential of a philosopher, this work would be epoch-making, and its author would be a thinker of the first rank. He claims to have formulated a case—to his mind, abso-